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EXAMINER
OLSEN, KAJ K

ART UNIT	PAPER NUMBER
1744	18

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/369,767	Applicant(s) NEUMANN, HARALD	
	Examiner Kaj Olsen	Art Unit 1744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1 and 5-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato (4,909,922) in view of any of Kojima et al (4,629,549), Nakajima et al (4,787,966), Ohyama (5,203,983), and/or Sone (4,365,604) and with evidence by Logothetis et al ("High-temperature Oxygen Sensors", ACS Symposium Series).

2. Kato discloses an electrochemical sensor comprising a solid electrolyte element including a first electrode 22, a second electrode 24 in the reference duct 72, and a heating element 36 where the second electrode is situated closer to the heating element than the first electrode (fig. 7). In addition, Kato discloses in the embodiment of fig. 7 coupling the second electrode to the lower potential terminal of the heater element. Fig. 7 also shows the second electrode extending over the width of the reference duct. Although the lower potential element is not specified as being ground, it is conventional in the art to utilize ground as the lower potential element. This is evidenced by the references Sone, Ohyama, Nakajima, and Kojima. These references are a sampling of the myriad of references available showing the conventional use of ground as a negative potential for the heater element. In particular, Sone teaches utilizing the automotive battery as the power source for the sensor components (fig. 4, and col. 8, lines 34-51). Because automotive batteries typically utilize ground as the negative terminal of the battery, it thereby follows that it would have been obvious to one of ordinary skill in the art at the time the

invention was being made to utilize ground as the negative terminal for any components powered by the automotive battery (such as the sensor of Kato) to simplify the electrical construction. The same use of ground as the negative potential of the battery can also be found in Nakajima (fig. 3), Kojima (fig. 2), and Ohyama (fig. 1). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize ground for the negative terminal of the heater as taught by Ohyama, Kojima, Nakajima, or Sone because the ground potential is a convenient lower potential available for a heater resulting in simpler electrical construction. Because it is obvious to ground the second electrode, and the first electrode would be at a lower potential than the second electrode due to the electromotive force (EMF) induced by the difference in oxygen partial pressure between the reference and exhaust gas, said first electrode would inherently be negatively polarized by induced EMF. In other words, when the oxygen partial pressure exposed to electrode 22 is lower than the oxygen partial pressure exposed to electrode 24, the potential at electrode 22 will be lower than the potential at electrode 24 (i.e. negatively polarized) (see equation 2 and fig. 1 of Logothetis for discussion of EMF).

3. With respect to the size of the electrodes, both Nakajima and Kojima set forth the use of electrodes which are all the same size. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize electrodes which are the same size because the art already recognized the use of electrodes which are all the same size and such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955).

4. With respect to the electrolyte material, see (col. 10, lines 39-44). With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Kato ('922) does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize 12 volts since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26).

5. Claims 2-4 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato ('922) and Ohyama, Kojima, Nakajima, or Sone in further view of Logothetis et al ("High-temperature Oxygen Sensors", ACS Symposium Series)

6. Kato disclosed all the limitations of the claims, but did not explicitly recite the use of operating voltages for the electrodes. Kato instead disclosed utilizing the sensor for the measurement of the induced electromotive force. Logothetis discloses that there are a number of advantages to operating the sensor with an induced current (as opposed to relying on the electromotive force), including that the output of the sensor becomes linearly proportional to the oxygen concentration in the gas (fig. 1, 2 and the associated discussion). This allows for wide

sensing range (electromotive based sensors are typical only sensitive at a particular air-fuel ratio) and it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of Logothetis for the invention of Kato to provide a sensor giving an output linearly proportional to the measured gas concentration. The teaching of applying a voltage across the electrodes of Kato would result in a negative voltage being applied to the first electrode 22 because Kato already rendered obvious grounding the second electrode which should be at a higher potential than that of first electrode (fig. 2 Logothetis) (hence the potential applied to 22 would be negative).

7. Claims 1, 7, 8, 10, 12-15, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stahl et al (4,400,260) in view of Ohyama, Kojima, Nakajima, or Sone and as evidenced by Logothetis.

8. Stahl discloses an electrochemical sensor which comprises a solid electrolyte element 25 with first and second electrodes (27, 29 respectively), a heating element 30, where the second electrode 29 is situated closer to the heating element that the first electrode (fig. 4 and 5). Stahl also discloses connecting the second electrode 29 to a common element 33 with the negative lead of the heater. Although Stahl never discloses the common element to be at a ground potential, ground is a convenient potential available in the application of these electrochemical sensors (see discussion above with respect to Ohyama, Kojima, Nakajima, or Sone). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Ohyama, Kojima, Nakajima, or Sone with the sensor of Stahl because the prior art recognized the use of ground as a convenient lower potential for the heater. The use of ground as the lower potential for heater also simplifies circuit construction for the reasons set forth

above (especially with respect to Sone). With respect to the polarization level of the first electrode, Stahl discloses operating the sensor in potentiometric mode (col.3, lines 11 and 12). In such an application, the polarization of the first electrode will be a function of the difference in oxygen levels in the gas being measured and in the reference passage. If the oxygen were greater in the measured portion than in the reference passage, the first electrode would be inherently negatively polarized (again, see discussion of EMF in Logothetis). Because the claim does not specify an operating condition where the measured gas concentration is less than the reference gas composition, Stahl would inherently meet the polarization limitation when the measured gas is of a greater concentration than the reference gas. The electrolyte of Stahl is zirconia (col. 3, line 13) and the heating element is placed on a protective coating (col. 5, lines 66-67). With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Stahl does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize 12 volts since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26).

9. With respect to the new limitations drawn to the use of an electrlolyte tube, see col. 5, lines 16-26.

10. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase et al (5,413,683) in view of Kato (4,909,922).

11. Murase discloses an electrochemical sensor which comprises a solid electrolyte element 14 which includes a first electrode 32, a second electrode 30. Although not shown in the figures, Murase further discloses the use of a heating means for operating the sensor at elevated temperatures (col. 12, lines 32-35). Murase does not explicitly identify where the heating means would be located on the disclosed sensor, Kato teaches that it is conventional in the art to place the heater below the electrodes at a lower portion of the sensor (fig. 1-7). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Kato for the sensor Murase because placing the heater at the lower portion of the sensor has been identified as being a conventional location for sensor heaters. In this case, the second electrode 30 would be situated closer to the heating element than the first electrode. In addition, Murase teaches coupling the second electrode to ground while negatively polarizing the first electrode by the application of a negative voltage with respect to ground. The negative voltage provided to the first electrode controls (powers) the measuring circuit (fig. 3 and associated discussion). The first and second electrodes have approximately the same sizes and the second electrode communicates with an atmosphere 16 which would read on the applicants use of the term "reference duct" giving the term it broadest reasonable interpretation. With respect to the atmosphere being a reference atmosphere, the claim has not sufficiently defined

the term reference in the claim in a manner which would obviate the examiner from interpreting said atmosphere as being a reference atmosphere.

12. With respect to the choice of electrolyte, see col. 6, lines 14-15. With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Murase does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize 12 volts since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26). With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. Kato taught embedding the heater into an insulating member (see discussion above).

13. Claims 15-20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato ('922) and Ohyama, Kojima, Nakajima, or Sone (with or without the teaching of Logothetis) as applied to claims 1 and 21 above, and in further view of Liu et al ("Oxygen Sensors" from Engineered Materials Handbook, Vol. 4).

14. Claims 15-17, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase in view of Kato as applied to claim 1 above, and further in view of Liu et al.

15. The references set forth all the limitations, but did not explicitly teach the use of a tubular solid electrolyte element. Liu teaches, in an oxygen sensor review, that oxygen sensors can be conventionally constructed using either planar elements (like those utilized by Kato and Murase) (fig. 1b) or a tubular configuration (fig. 1a) (see also fig. 3). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Liu for the sensors of Kato and Murase because the art recognized that tubular elements are an alternative form of sensor construction and the substitution of one known means of constructing a sensor for another, when the results are not unexpected, requires only routine skill in the art. With respect to Kato and the claims of 16-18, the use of a power source was already rendered obvious by the teaching of Logothetis (see rejection for claims 2-4, and 21).

Response to Arguments

16. Applicant's arguments filed 3-6-2002 have been fully considered but they are not persuasive. With respect to the rejection utilizing Kato, Applicant urges that the examiner has not identified any suggestion or motivation to modify the teaching. This is not persuasive. The motivation or suggestion came from the teaching that ground is a conventional potential utilized as a negative potential in automotive engines. This stems from the fact that it is conventional in the art to connect the negative terminal of a battery (the conventional electrical source for automotive electrical components) to ground and run all the electrical devices off the positive voltage and ground of the battery (see Sone). To utilize anything other than ground would greatly complicate the electrical circuitry because a practitioner would have to establish a circuit utilizing a separate negative potential element from the grounded negative terminal of the

battery. In fact, in all the art the examiner identified that explicitly stated what potential the negative terminal of the heater was being maintained at, the examiner found *no* examples of the use of a potential other than ground. The applicant is essentially urging that it would not have obvious to connect Kato in a manner that all the previous prior art appears to have utilized. In addition, even if there were teachings in the art about the use of potentials other than ground, this would not obviate the fact that the art has demonstrated the wide spread use of ground as being a useful and conventional potential. Unless the applicant has particular evidence to suggest that Kato could not have utilized ground as the negative potential for the heater, a skilled practitioner would clearly have been motivated to utilize ground for the reasons set forth both above and in the previous office action.

17. Applicant argues that regardless of the merits of the teaching of Sone, Ohyama, Nakajima, or Kojima, the prior art alone or in combination still doesn't teach a second electrode coupled to ground. However, if it were obvious to couple the negative terminal of the heater of Kato to ground (see above), then the second electrode of Kato would also be coupled to ground because the second electrode is coupled to the negative terminal of the heater, which is coupled to ground. How does the prior art in combination not suggest this limitation?

18. Applicant urges that the examiner intermixing inherency and obviousness in its rejection with Kato as first discussed in the appeal brief. However, whatever relevancy this point had in the appeal brief is immaterial with the previous rejection that post-dates the appeal argument in question. The examiner stated, in this and the previous office action, that some of the limitations of the claim are inherent while *other* limitations of the claim are obvious in view of secondary teachings. The cited case law concerns a rejection where a given limitation is found to both

inherent and/or obvious. This is irrelevant to the present issue here. The inherency and obviousness in the present case concern two separate aspects of the claims.

19. Applicant also urges with respect to the claims drawn to the electrodes being the same size that drawings of Nakajima and Kojima are not necessarily to scale. Irrespective of the appropriate scale of the figure, the examiner has relied on the figures not for any particular element size, but on the relative size of two identical elements (i.e. electrodes). In other words, the examiner is not relying on any measurement of the drawing features, but on the fact that the references shows the two identical elements to be in proportion to each other in a constructed sensor. In addition, this argument does not obviate the fact that, regardless of whether these or any other references explicitly suggest the use of same sized electrodes, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize similar sized electrodes because finding the appropriate electrode size requires only routine skill in the art. Applicant urges that the applicant utilizes approximately same sized electrodes to provide further shielding against coupling with the heater voltage. However, it is well settled that a patent cannot be granted for an applicant's discovery of an result (in this case, the shielding from coupling by utilizing electrodes of the same size), even though it may be unexpectedly good, when utilizing similarly sized electrodes is already shown by the prior art or would flow logically from the teaching of the prior art.

20. Applicant urges the Logothetis does not cure the deficiencies of the primary and secondary teachings with respect to claims 2-4. However, applicant provides no arguments concerning how Logothetis fails or how the examiner is in error with his interpretation of it and the claims in question.

21. With respect to Stahl and the use of evidentiary reference Logothetis, applicant believes the examiner is in error with his arguments. In particular, applicant points to the teaching of Logothetis where it teaches that the electrode exposed to the lower oxygen partial pressure would be negatively polarized. The examiner does not dispute this. However, nothing in the claim suggests that the second gas side electrode necessarily has to have the lower oxygen partial pressure. Sensors in use in exhaust gases will typically have a lower potential on the measuring (or second) gas electrode (due to the lower levels of oxygen in exhaust over reference oxygen sources) and Stahl would thereby fail to read on the claims. However, claim 1 essentially requires the second electrode to be capable of being negatively polarized (the measuring electrode is negatively polarized because the first electrode is grounded and the oxygen induces a negative potential. That condition would be met in Stahl if the gas exposed to the measuring electrode had a greater oxygen partial pressure than the gas the first electrode were exposed to. Nothing in the claim prevents the examiner from interpreting the claim in this manner.

22. With respect to Murase, applicant urges that the reference electrode 24 is not connected to ground and fails to meet the claim limitations. However, the examiner is not relying on electrode 24. Rather, the examiner is relying on electrode 30, which is closer to the heater than electrode 32 and is grounded. Hence, this reads on claim 1. Applicant is apparently referring to electrode 24 because it is the reference electrode of the sensor, much like the second electrode of the instant invention is functioning as a reference electrode. However, the claims do not specify that the second electrode has to be a reference electrode, nor does it specify that no other electrodes can be situated between the heater and this second electrode. With respect to the claims that do specify the electrode is a reference electrode, the electrode is not being claimed in

a manner that the use of the electrode as a reference electrode constitutes the intended use of the electrode. The intended use need not be given further due consideration in determining patentability

23. Applicant also urges that element 16 cannot read on the term reference duct. This is unpersuasive. The chamber in question would clearly read on the term "duct" giving the claim language its broadest reasonable interpretation. The term "reference" is only the intended use of the duct and the intended use need not be given further due consideration in determining patentability of an apparatus.

24. Applicant also urges that the examiner has not identified anything in Murase with respect to the use of similarly sized electrodes. However, every drawing of the electrodes being relied on (30 and 32) show them to be the same size.

Conclusion

25. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

26. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj Olsen whose telephone number is (703) 305-0506. The examiner can normally be reached on Monday through Thursday from 8:00 AM-5:30 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner are unsuccessful, the examiner's supervisor, Mr. Robert Warden, can be reached at (703) 308-2920.

When filing a fax in Group 1700, please indicate in the header "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communications with the PTO that are not for entry into the file of this application. This will expedite processing of your papers. The fax number for this Group is (703) 305-7719.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, whose telephone number is (703) 308-0661.

Kaj K. Olsen, Ph.D.

Patent Examiner

AU 1744

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